

Preliminary Draft

Whidbey Basin Characterization

June 16, 2008

Instructions for Reviewers:

Developing a characterization of a region as large and diverse as the Whidbey Basin is not an easy task, and one that cannot be done in a vacuum. Input from the people who live and work in this Basin, who study and deal with these issues often on a daily basis, is vital to making this a meaningful document. The document before you is a beginning framework with some of the pieces filled in. It is very much a preliminary draft and there are many gaps. Your engagement and contributions are needed to help identify and fill those gaps, and refine the information presented.

As you read and critique this document please try to answer the following questions:

- 1) What information and associated documents are missing? If possible, please provide the information and source.
- 2) Is the information provided accurate to the best of your knowledge? Can you provide documented information to clarify?
- 3) Do you see this process as a useful effort? If not, how could it be improved?

During the development process, there will be two opportunities to provide written comments and one opportunity to meet and discuss this paper with your peers.

- June 20th Initial written comments due to linda.lyshall@psp.wa.gov.
These comments will contribute to the work session discussion.
- June 24th Technical work session at Padilla Bay, 9-4.
 - RSVP to linda.lyshall@psp.wa.gov
 - Come prepared to discuss at least one topic area in detail.
 - Bring questions you would like answered and insights you would like to share.
- July 7th 2nd round written comments due to linda.lyshall@psp.wa.gov.

Acknowledgements

This document is being produced with input from many environmental science and policy experts who live and work within the Puget Sound region, most of them within the Whidbey Basin. Guidance to produce this document is being provided by the Puget Sound Partnership Whidbey Basin Core Team and Representatives. The Core Team comprises representatives from state and local agencies, tribes, watershed groups, Washington State University and conservation groups. Each of the participating entities plays a key role in implementing or supporting ecosystem management programs in the Whidbey Basin.

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Introduction

The Puget Sound Partnership is charged with positively affecting fundamental elements of the health of Puget Sound through development and implementation of an Action Agenda. The primary goal of the Whidbey Basin Characterization is to help inform the development of the Action Agenda by providing a succinct overview of the ecological conditions, assets, threats, concerns, and priorities of this area. This document is a compilation of information derived from existing studies and reports. The priorities listed were developed as part of prior efforts and their associated review processes.

To provide consistency with the development of the broader Action Agenda, the characterization addresses the six primary topic areas: water quality, human health, habitat and land use, water quantity, species and biodiversity, and quality of life. Recognizing the interdependence of these topic areas, this report is a first step in the compilation of information that will inform a subsequent synthesis across topic areas.

This document was born of a need to better collectively understand the issues and concerns within the terrestrial and aquatic environments of the Whidbey Basin. Developing this characterization has the potential to increase the knowledge and understanding for all of the people working in this region on these issues, and to help develop more cohesive approaches to the complex problem of recovering Puget Sound.

General Physical Description

The Whidbey Basin is the largest sub-basin in Puget Sound, draining approximately 6100 square miles and comprising over a quarter of the entire Puget Sound Basin. The Whidbey Basin includes the two largest river systems entering Puget Sound, the Skagit and Snohomish, as well as the Stillaguamish watershed, Whidbey and Camano Islands, and numerous small islands, coves, bays, and passages.

Marine waters in the northern portion of the Basin include Samish Bay, Padilla Bay, Fidalgo Bay, Guemes Channel, and Skagit Bay. Saratoga Passage flows between Whidbey and Camano islands and connects Penn Cove and Holmes Harbor on the east side of Whidbey Island. Port Susan lies between Camano Island and the mainland at the mouth of the Stillaguamish River and adjoins Possession Sound at the south end. Port Gardner is an inlet of Possession Sound and lies at the mouth of the Snohomish.

There are approximately 350 miles of marine shoreline and the total area of deep-water and nearshore is approximately 157,000 acres or 245 square miles. The largest island in Puget Sound, Whidbey is 45 miles long, with 235 square miles and 200 miles of shoreline. Camano Island is 18 miles long, 40 square miles, and has 52 miles of shoreline.

Climate and Freshwater

Local mountain ranges cause precipitation levels to vary widely across the Whidbey Basin. The Olympic Mountains reduce precipitation (rain shadow effect) over Island County and western Skagit County. Precipitation levels increase with elevation and up the valleys of the Skagit, Stillaguamish, and Snohomish watersheds as clouds meet the Cascade Mountain range.

Whidbey Basin watersheds rely on different sources of water to keep them flowing. The Skagit is fed through the summer by glaciers and higher elevation snow pack on Mt. Baker, Glacier Peak and the North Cascades. The Samish, Stillaguamish and Snohomish systems are fed from lower elevation snow fields and groundwater resulting in different flow regimes during the high and low flow seasons. Maintenance of cool summer base flow in many small streams is dependent on the storage capacity of recessional outwash geology. Outside the rainy season, Island County streams depend solely on groundwater storage and wetlands to sustain flows.

Tides

The surface waters of the Whidbey Basin are renewed rapidly, because of the large volume of river discharge that the basin receives from the three rivers. Tidal waters of the Whidbey Basin exhibit classic estuarine characteristics. Fresh water outflow from the rivers rides over the top of the salt water entering the basin from the Strait of Juan de Fuca through Deception Pass and Possession Sound; mixing of these waters by a combination of tidal action and variable winds creates constantly changing gradients of salinity in the nearshore areas. These dynamic waters provide a continuum of habitats well suited to a diversity of marine and estuarine species including anadromous salmonids and resident and migratory marine invertebrates, fish, birds, and mammals.

Major Rivers

The Skagit River basin is the largest freshwater system draining to Puget Sound and is the third largest river on the west coast of the United States. The Skagit system is comprised of the mainstem Skagit and tributaries as well as four significant sub-basins: the Baker, the Cascade, the Sauk, and the Suiattle. It encompasses over 3,100 square miles of watershed area and 80,728 acres of delta. The Skagit drainage includes numerous glaciers and elevations up to 10,788 feet on Mt. Baker.

The Snohomish River basin is the second-largest freshwater system draining to Puget Sound. The basin drains approximately 1,856 square miles in both King and Snohomish counties. The Skykomish and Snoqualmie Rivers originate in the Cascade Mountains and join near the City of Monroe where they become the Snohomish River. The Snohomish River flows into the estuary near the City of Snohomish and joins Puget Sound between Everett and Marysville.

The Stillaguamish River basin is the fifth largest freshwater system in Puget Sound and drains approximately 694 square miles. Eight salmonid species use these waters for spawning and rearing. The Stillaguamish Watershed can be divided into three general regions: the North Fork, South Fork, and Lower Mainstem. The four largest tributaries are Pilchuck, Deer, Boulder, and Canyon Creeks. Elevations in the watershed range from sea level to about 6,854 feet on Three Fingers Mountain. The watershed drains into Port Susan and Skagit Bay.

The Samish River is a much smaller drainage entering Samish Bay at the northern boundary of the Whidbey Basin. The Samish watershed encompasses approximately 123 square miles of mostly lower elevation terrain. The watershed consists of three subbasins – Samish River, Friday Creek and Thomas Creek. Eighty percent of the upper Samish basin is dominated by forests, and about 10 percent is used for commercial agriculture.

Unique ecosystem characteristics and assets

The Whidbey Basin, with three major river systems, produces a significant proportion of the salmon in Puget Sound. The Basin provides natal habitat for 10 of the 22 independent Chinook populations and supports nearly every fish, shellfish, and bird species found within Puget Sound. Marine shoreline and riparian habitat ranges from vertical high bank feeder bluffs, mostly along portions of the larger islands, to extended tide flats, especially near the mouths of the major rivers. Freshwater habitat ranges from broad mainstem rivers to the smallest, steepest headwater streams in the upper reaches of the watershed. It is also the largest commercial agricultural area in Western Washington, producing over 80 products including potatoes, wheat, berries, tulips, seeds, dairy, and beef. Much of this agricultural production occurs in close proximity to the Basin's rivers and estuaries and often occurs on diked former tide lands. Samish Bay is an important commercial shellfish area.

All three major river basins are characterized by forested headwaters in the Mount Baker – Snoqualmie National Forest, North Cascades National Park and state owned forests. . The forested areas include several designated Wilderness areas, including the recently designated Wild Sky Wilderness in the Skykomish basin, and the several designated and proposed Wild and Scenic Rivers. Federal, State and privately managed working forests are a prominent element of the landscape.

The lower floodplains of the major rivers support regionally important agricultural activities. The rich alluvial soils in the valley bottoms have historically supported thriving agriculture. Small to medium-sized cities dot each of the mainstem rivers, with progressively bigger urban centers farther downstream. The largest urban centers and industrial waterfronts – like Everett/Marysville and Mount Vernon/Burlington – are prominent features of the lower floodplains and estuarine portions of two of the major river basins.

In the Sauk, and its tributary Cascade, White Chuck, and Suiattle rivers comprise one of the largest undammed river systems remaining in the Pacific Northwest. The Skagit Wild and Scenic River designation begins just east of the town of Sedro-Woolley, extending to Bacon Creek near the boundary of the Ross Lake National Recreation Area in the North Cascades National Park Service Complex. The Skagit Wild and Scenic River System includes 158.5 miles of the Skagit River and its tributaries—the Sauk, Cascade, and Suiattle rivers. Dams on the Skagit mainstem and on the Baker River are discussed in the ecosystem concerns section.

The Skagit, Stillaguamish, and Snohomish River systems support all five species of northeastern Pacific salmon, plus winter and summer steelhead, and bull trout (see species and biodiversity section below for stock structure). Many of these are healthy and regularly support tribal and non-Indian directed fisheries both in the rivers and in nearshore marine waters. There is also significant hatchery production of Chinook, coho, and chum salmon, as well as steelhead that support these fisheries.

As the three major rivers spill into the Sound, they mix freshwater and saltwater to create extensive estuarine marshes that produce a vast quantity of decaying organic matter, which feeds the abundant invertebrate life in the tide flat sediments. These tiny creatures, in turn, feed the shorebirds and waterfowl that make the bays and nearshore areas important stops for migratory birds traveling along the Pacific Flyway. The marshes, vast mudflats and tidally influenced channels support hundreds of thousands of birds, several species of salmon, smelt, English sole and clams.

Large eelgrass beds are located in Samish, Padilla, Fidalgo and Skagit bays. Eelgrass is also found along Saratoga Passage shorelines and along much of the shoreline of the sheltered areas east of Whidbey Island. Substantial kelp beds add to productivity along shorelines exposed to greater wave and current energy.

Skagit River Basin

The Skagit supports all five local species of salmon and is home to six of the region's 22 populations of threatened Chinook salmon. The Skagit has the largest population of listed bull trout and possesses 26 of the 52 local populations of bull trout present in the Puget Sound. The upper Skagit River watershed supports a high diversity of wildlife species, including grizzly bears, wolves, marbled murrelets, and northern spotted owls. The Skagit has the largest overwintering population of bald eagles in the U.S. and the highest number and variety of raptors in North America.

The lower watershed possesses tidal freshwater marsh and estuary areas that provide important habitat for migratory waterfowl, raptors, and outmigrating juvenile salmon. The high biodiversity of the Skagit River watershed is a result of its complex and steep topography, a diverse drainage system which includes the Cascade, Sauk, and Suiattle rivers, and relatively high level of land protection in the upper watershed. Almost fifty percent of the Skagit Watershed is in federal ownership, with most of the headwater areas within the boundaries of North Cascades National Park, USFS wilderness areas, and British Columbia provincial parks. The Skagit River is also an important source of electricity for the region.

Snohomish River Basin

The eelgrass beds in the Snohomish River delta are among the largest, if not the largest, found in the central and southern Puget Sound. This is important habitat for the Snohomish Chinook populations, as well as to Chinook and other salmon species from elsewhere in Puget Sound. The Snoqualmie and Skykomish Rivers each host a population of threatened Chinook salmon. The Snohomish watershed also is home to threatened bull trout and Skykomish and Snoqualmie River coho. Abundant populations of chum and pink salmon and steelhead also inhabit the Snohomish system. The Snohomish has four local bull trout populations: North Fork Skykomish, South Fork Skykomish, Salmon Creek, and Troublesome Creek. The Tulalip Tribes, Port of Everett, City of Everett, Washington Department of Fish and Wildlife, and Snohomish County have acquired and are restoring more than 1,200 acres in the estuary (Nearshore Cooperative Report).

Stillaguamish River Basin

The Stillaguamish River is home to two populations of listed Chinook in the North Fork and South Fork. The watershed also supports Stillaguamish and Deer Creek coho; North and South Fork pinks and fall chum; South Fork, Deer Creek and Canyon Creek summer steelhead. The Stillaguamish Chinook salmon populations are regionally important because they are indicator stocks for West Coast fisheries.

Port Susan is widely recognized as an important area for marine resources with eelgrass, marshes, and vast mudflats. The Nature Conservancy owns 4,122 acres of valuable estuarine habitat in the northeast portion of Port Susan--it is one of the largest privately-owned marine nature preserves in the world. Island County has designated the entire western portion of Port Susan as a Marine Stewardship Area.

Port Susan Bay provides critical habitat for Western Sandpipers and Dunlin and supports more than 20,000 shorebirds in a season. This site is used by large flocks of ducks, such as Northern Pintail, Mallard, American Wigeon, and Green-winged Teal, also Trumpeter and Tundra Swans, Snow Geese, sparrows, and 16 species of raptors.

Samish River Basin

About 1,100 acres of Samish Bay's tide flats are currently farmed for commercial production of shellfish: primarily Pacific oysters, Manila clams, mussels and geoduck; commercial production in 2004 was valued at \$2.4 million.

Island County Watershed

The Island County watershed supports the early marine life history of juvenile Chinook from the Skagit, Stillaguamish, Snohomish and other Puget Sound rivers. The shoreline of Island County provides habitat for rearing, shelter from predators and migration during a critical period of physiological transition. The pocket estuaries of Island County are believed to be especially important for early migrating Chinook, chum, pink salmon fry and forage fish. Chum and pink salmon are also present in streams on Whidbey Island, and coastal cutthroat are present in streams on Whidbey and Camano islands. Coho salmon are known to spawn in streams on South Whidbey Island and are found in streams on Camano Island. Approximately 300 Pigeon Guillemots, a state priority species, breed on Whidbey Island coastal bluffs and feed in adjacent nearshore areas.

Other Marine Areas

Possession Sound is an important migratory channel for marine mammals, including gray whales and orcas, harbor seals and California sea lions. All of the bays of the Whidbey Basin produce Dungeness crab and spot prawns in sufficient quantities to support tribal and non-Indian fisheries. Overwintering waterfowl and shorebird populations are large and support substantial recreational bird watching and hunting.

Land use, population, and economy

Counties and Cities

The Whidbey Basin includes all of Island, most of Skagit and Snohomish, and northeastern King counties. Planning areas under the State Watershed Management Act include WRIs 3, 4, 5, 6, and 7. Larger cities and towns within this area include Anacortes, Arlington, Burlington, Carnation, Concrete, Coupeville, Darrington, Duvall, Everett, Gold Bar, Granite Falls, Hamilton, Index, Lake Stevens, La Conner, Langley, Lyman, Marysville, Mill Creek, Monroe, Mt. Vernon, Mukilteo, North Bend, Oak Harbor, Sedro-Wooley, Snohomish, Snoqualmie, Skykomish, Stanwood, and Sultan.

Tribes

Federally recognized Tribes with land base in the Whidbey Basin include Tulalip, Swinomish, Sauk-Suiattle, Upper Skagit, Stillaguamish, and Snoqualmie. The usual and accustomed fishing areas of several other tribes also include portions of the Basin. Tribes manage much of their own tribally owned lands for development and conservation purposes. Tribes with usual and accustomed fishing rights have the explicit right to harvest fish and an implied right to protect fish habitat. They also co-manage the fisheries in cooperation with WDFW.

Population

Population growth for the Whidbey Basin has surpassed population growth rates in other areas of the state with a 25% (verify) increase between 1990 and 2001. The trend is continuing as can be seen by Washington's Office of Financial Management's population projections in Table 1 below.

Table 1. Whidbey Basin Medium Population Projections by County to 2030

	2000	2005	2010	2015	2020	2025	2030	% change
County								
Snohomish	606,424	655,800	725,963	786,476	844,541	898,715	950,066	31%
Island	71,558	76,000	80,703	87,334	94,275	100,985	107,126	29%
Skagit	102,979	110,900	123,888	135,589	150,305	164,643	178,036	38%
NE King	61,665	64,195	72,369	77,218	81,817	86,254	90,458	29%
Totals	842,626	906,895	1,002,923	1,086,617	1,170,938	1,250,597	1,325,686	32%

Source: Washington State Office of Financial Management (OFM)

Economy

The region has a healthy economy that has shifted in the past three decades away from resource-based economies, such as forestry, fish, and agriculture toward other economic sectors, such as housing and light industrial, with many economic development groups focused on technology industries. The pulp, shingle and saw mills in the Snohomish estuary and around Anacortes are being replaced by waterfront condominiums. Currently the housing industry has slowed and is having a ripple effect on the small remaining

timber industry reducing the price of lumber. The high cost of housing, however, is driving our growth farther and farther into our rural lands increasing pressure to develop forests and farms.

Agriculture

Agriculture is a prominent activity in lower and mid-valley floodplains of all the major rivers although recent decades have seen a general decline in agriculture. The Whidbey Basin is the largest commercial agricultural area in Western Washington and produces numerous agricultural products with markets worldwide. The dairy industry that dominated agricultural land use over the past century is all but gone in most of the valleys. There is a current effort to successfully reinvigorate local agricultural activity in the Snohomish watershed and to maintain existing agriculture in the Skagit watershed. In the Stillaguamish, a pilot Transfer of Development Rights project is underway with the intent to protect the Valley and farmland between Interstate 5 and Highway 9. The lack of local infrastructure, such as slaughter houses and food processing facilities, presents a critical challenge to this effort. In addition, much of the estuarine land in the Snohomish watershed has subsided over one meter resulting in drainage problems that constrain the economic viability of these farms.

In Skagit County, the tulip festival provides tourism revenues in addition to revenues from the agricultural base. Snohomish County is actively pursuing an Agricultural Sustainability project that seeks to maintain and enhance agricultural uses for future generations. The current strategy is to identify alternative crops that grow well in the Whidbey Basin and will be of high value to local citizens. As a result, organic agriculture and local markets are increasing.

In the Snoqualmie Valley, agricultural uses have led to establishment of many Community Supported Agriculture (CSA) programs. CSA creates a link between farms and consumers by allowing consumers to purchase regular weekly shipments of farm produce and other goods directly from producers. Many farms with CSA programs also provide education to members and the public about organic farming and about cooking with organic foods. Also in the Snoqualmie Valley, a non-profit organization, Stewardship Partners, started their efforts for Salmon Safe farm certification, a program that sets standards for agricultural practices with an end result in a market certification that the farm supports both farms and fish. PCC Co-op, a local Puget Sound food cooperative, has initiated a program whereby profits from the market are put back into the local agricultural community by purchasing farmland to preclude conversion of agricultural lands to other uses. This program has started in the Snoqualmie Valley, with the purchase of two farms. Skagit County has a taxpayer-funded Farmland Legacy Program which also purchases development rights on agricultural lands. Currently over 6000 acres are enrolled in the program.

Transportation

In 2000 travel time to work for adults 16 and over, who did not work at home ranged from 22.5 to 31.9 minutes in the Whidbey Basin. Approximately 6.7-6.9% of the

population 16 and older who worked outside of the home used public transportation to get to work. Recent fuel prices, however, has likely increased this percentage.

Land use

Approximately xx percent of the uplands within the Whidbey Basin are protected from development through land use designations as parks (national, state, and county), wilderness areas, or refuges. A majority of these designated lands are in the upper, mountainous portions of the watershed. An additional xx percent of the Basin is largely protected in managed forest areas either in the Mt. Baker Snoqualmie National Forest or in state-owned forests managed by WDNR.

Agricultural and managed forest lands are preferable to hardened, urbanized landscapes both hydrologically and for habitat benefits. But agriculture also poses distinct challenges for water quality and for natural floodplain functions, particularly in areas where extensive flood control facilities have been constructed to protect agricultural areas. Currently, 58 percent of the Stillaguamish floodplain is in agricultural use. Similarly, 58% of the Snoqualmie River's 100-year floodplain, including portions of key tributaries, is within the Agricultural Production District. Xx percent of the Skagit River floodplain is in agricultural use.

The Stillaguamish watershed is a mainly rural watershed with Arlington, Stanwood, Granite Falls and Darrington as the population centers. The watershed's land use is dominated by forestry 76% with rural 17%, agriculture 5% and the cities only covering 2%.

In the upper Snohomish watershed nearly 75% of the land use is forestry with 60% of the total forestry lands in public ownership. Though much of these lands are protected from residential development, there is still a significant risk of conversion of land from forest lands to residential development in certain areas, threatening water quality and watershed processes. For example, parcels in King County's Forest Production District (FPD) can be developed one unit per 80-acre parcel. Forest lands outside the FPD are even more at risk.

In the Snoqualmie Watershed, there are over 500 forested parcels totaling over 20,000 acres in the rural area at risk of subdividing and developing. The Snohomish watershed is one of the faster growing watersheds in the region, with impervious surface increasing 15.7 percent from 1991 to 2001.

The Whidbey Basin has approximately 350 miles of marine shoreline of which 44 percent is armored to some degree. There are approximately 5,000 overwater structures, consisting of ramps, piers and docks, small slips, and large slips. The Burlington Northern – Santa Fe railroad occupies the shoreline and riparian area along 3.8 miles of shoreline from Mukilteo northeast to Everett.

A shoreline armoring study on Whidbey Island determined that 22% of the shoreline had been altered. Land parcels comprising nearly 80% of the County's shoreline are

developed, primarily with platted single family communities. Current shoreline density ranges from 3 to 5 units per acre to 1 unit per 5 and 20 acres. The average density in platted sites is about 2 units per acre.

Land Trusts

Cascade Land Conservancy

The Cascade Land Conservancy (CLC) developed the Cascade Agenda to further innovations in community development, green building, and housing and transportation. The Agenda is a 100-year visionary regional program to conserve 1.3 million acres of working forests and farmlands and revitalize cities and towns throughout the region. CLC efforts are focused on creating new public and private financing mechanisms, such as Public Conservation Authorities and Community Forest Bonds and exploring new revenue streams for foresters and farmers such as environmental mitigation, biosolids application, carbon sequestration, compensation for water recharge services, and recreation fees. The CLC has completed 26 projects in Snohomish County and has conserved over 11,000 acres.

Whidbey-Camano Land Trust

The Whidbey-Camano Land Trust's strategy is to acquire and protect properties that have significant ecological value preferably with large acreages and corridors linking protected areas that support healthy ecological systems. Preference is also given where conservation values are highly threatened and where there are multiple land protection objectives. Priority areas are coastal areas, wetlands and streams, wildlife habitat, and working farmlands. Since 1984, the Whidbey-Camano Land Trust has protected 5,187 acres, with another 1,474 acres in progress.

Skagit Land Trust

The Skagit Land Trust has helped to protect over 5,000 acres in Skagit County through conservation easements and acquisition. This includes 532 acres of intertidal habitat, 3,390 acres of forested habitat, 564 acres of agricultural lands, 572 acres of wetlands, and 22 miles of river shoreline.

The Nature Conservancy

The Nature Conservancy has been working in the Skagit River and delta for more than 30 years to protect wildlife habitat, improve water quality and maintain or improve the economic vitality of participating farmers. Partnering with the Washington Department of Fish and Wildlife, the Conservancy created the Skagit River Bald Eagle Natural Area, which now, with another six landowning partners and has preserved more than 9,000 acres of eagle habitat. The Farming for Wildlife program is helping Skagit Delta farmers incorporate flooding into their crop rotations to create important wetland habitat for shorebirds as well as maintain family farms.

In Port Susan, The Nature Conservancy owns 4,122-acres, which includes much of the Stillaguamish River estuary and 166 acres of diked uplands. The Conservancy also owns 554 acres at Ebey's Landing on the western shore of Whidbey Island. This area

encompasses one of the least disturbed coastal wetlands in the state, old growth forest, prairie habitat, rare plants such as the golden paintbrush, and unusual species such as brittle cactus, the only cactus native to western Washington.

Skagitonians to Preserve Farmland

Skagitonians to Preserve Farmland is a land trust with a mission to protect farmland and ensure the continuance of the Skagit Valley agricultural industry through acquisition of permanent property restrictions, educating farmers about estate and tax law changes, and maintaining and creating policies at the local, state, and federal level that support agriculture. They have easements on 140 acres.

Trust for Public Land

The Trust for Public Land (TPL) is currently working with Washington State Department of Parks to secure ownership of a privately owned island for addition to the Deception Pass State Park.

King County Natural Lands

Lands managed by the King County Natural Resource Lands Program are divided into two management categories: ecological lands and working resource lands. Ecological lands are managed to protect valuable ecological systems such as riparian corridors and wetlands, and to preserve native habitat and biodiversity. Working resource lands are farms and forests that are managed to meet several objectives, including the production of food and wood products. Ecological and working resource lands provide low-impact passive recreational opportunities where appropriate.

Within the Snoqualmie watershed, King County Ecological Lands include nearly 900 acres distributed throughout the watershed, while working resource lands include the 320-acre Ring Hill Forest, located on the western flank of the lower Snoqualmie River.

Ecosystem Concerns by Topic

Water Quality

Many of the threats to water quality have decreased while others have amplified due to increasing human populations and consequent increased volume and load of some pollutants discharged. Water quality in the lower Snohomish Estuary and Port Gardner has improved in the last 50 years as a result of closures of pulp mills and other industries that historically dumped large quantities of untreated wastes directly into surface waters. Reductions in combined sewer overflows (CSOs) from the Mount Vernon and Everett wastewater collection systems are improving conditions in Skagit River and Possession Sound. Treatment of municipal wastes and the relocation of wastewater treatment plant outfalls have improved overall. Closures and relocations of many dairy farms have also contributed to improved water quality in freshwater areas. Threats still exist, however, from continuing industrial and municipal discharge of contaminants, and from ever increasing stormwater runoff and non-point source pollutants that have become recognized as major concerns.

Water quality sampling is done regularly at key locations throughout Puget Sound by state, tribal, and local governments. Within the Whidbey Basin, 466 combinations of water quality impairments are currently identified. The top three water quality impairments in the basin are dissolved oxygen, with 105 sites, bacteria, with 215 sites, and temperature, with 68 sites (Figure 1). In addition, large areas of contaminated sediment remain in the Port of Everett and the East Waterway of the Snohomish River. These types of known pollution problems in the Whidbey Basin are similar to those seen across Puget Sound. Some of the continuing threats to water quality are discussed in more detail below.

Low Dissolved Oxygen

Dissolved oxygen problems account for nearly a quarter of the known impairments in the Whidbey Basin (Figure 2). The Department of Ecology monitors data from 39 marine sites throughout Puget Sound. Of the eight sites rated of highest concern for signs of eutrophication, three are in the Whidbey Basin. These are Penn Cove, Possession Sound, and Saratoga Passage. Locations of high concern in the Whidbey Basin include Skagit Bay and Port Susan. Penn Cove has also showed an increase in ammonium, which is a nutrient that stimulates phytoplankton growth and can be toxic to marine life in high concentrations. Sections of Whidbey Basin are at risk of chronically low dissolved oxygen concentrations and consequent fish kills, similar to those that have occurred in Hood Canal.

Dissolved oxygen measures fail to meet standards seasonally in many watercourses within the Skagit, Stillaguamish, and Snohomish watersheds. In the Snohomish and Snoqualmie watersheds, dissolved oxygen levels are low in a number of areas such as the Quilceda/Allen Creeks, French Creek, Kimble Creek, Ames Creek, Patterson Creek, and Cherry Creek. Depressed dissolved oxygen levels also exist in a number of locations in the Stillaguamish watershed. Twelve waterbody reaches did not meet state standards including Warm Beach Creek, Pilchuck Creek, Portage Creek, March Creek, Kackman Creek, and the Stillaguamish River at RM 13.5, and RM 3. In most of the Whidbey Basin

watersheds dissolved oxygen measurements are made during midday hours and do not capture the most critical early morning hours when levels are likely to be lowest. Thus, the available data may underestimate dissolved oxygen problems in the basin.

The Snohomish Estuary has also experienced dissolved oxygen and ammonia problems in the past and was the subject of an early Ecology TMDL. The Department of Ecology required all municipal wastewater discharges in the area to reduce their discharge of oxygen depleting substances during the summer months. Reevaluation of estuary dissolved oxygen levels is needed to confirm that oxygen levels have improved. Wastewater treatment plants that formerly contributed to Snohomish River Estuary dissolved oxygen problems have been updated or rerouted to deeper water in Port Gardner.



Figure 1. Whidbey Action Area Water Quality Concerns. Data from the Department of Ecology's most recent Water Quality Assessment (2008) shows pollution concerns throughout the basin. Red and brown areas show water segments where one or more state standards are exceeded. Yellow areas indicate that preliminary data shows a potential pollution problem. Areas upstream and downstream of each segment shown are likely polluted as well.

Bacterial Contaminants

Bacterial pollution is widespread throughout the Whidbey Basin Action Area accounting for 48 % of listings of impaired waters (Figure 2). Ecology has documented the problem in water cleanup plans for excessive fecal coliform levels found in the Snohomish River Tributaries, Snoqualmie River, Lower Skagit River, Samish, and Stillaguamish watersheds. In Island County bacterial pollution threatens beneficial uses in Carp Creek,

Triangle Basin, and Utsalady. More recent monitoring by Island County has revealed problems in other tributaries as well. Most of Island County's shoreline communities have on-site sewage systems, many of which are old and failing. Stormwater runoff and failing septic systems are the main threats to Camano Island water quality. In all of these areas, bacterial pollution sources are typically difficult to pinpoint. Septic systems, livestock, wildlife, and pet waste are suspected as the leading causes of impairment. Urban, rural residential, and agricultural areas all show elevated bacteria levels.

Bacterial pollution increases the risk of personal illness as a result of water recreation activities in many areas. Bacteria levels are typically higher in summer months when swimming, river floating, and wading activities are most common. The State of Washington's Beach Environmental Assessment, Communication and Health (BEACH) program closed or advised against swimming at seven public swimming beaches in the Whidbey Basin from 2004 to 2007 due to sewer spills (2) and high bacteria counts due to unknown reasons. Three beaches have permanent closures or advisories.

Public and commercial shellfish harvests are also affected by the high bacteria counts found in Whidbey Basin waters (Figure 3). As noted earlier, the Samish, Skagit, Stillaguamish, parts of the Snohomish River and many tributaries fail to meet state standards for fecal coliform bacteria. The Fecal Pollution Index (FPI) for shellfish growing areas measured in Port Susan at $FPI = 2.40$, which is the second highest level in Puget Sound. Two commercial areas are now in the threatened category: Port Partridge in Island County and South Skagit Bay. Recently the Samish Bay shellfish growing area has suffered a series of emergency or voluntary closures due to excess bacteria. Illness outbreaks occurred in 1994 and in 2004. In Island County, the lower portion of Holmes Harbor is closed to both recreational swimming and shellfish harvest due to high bacteria levels in the area. (See Human Health section for additional information on shellfish closures.)

All of the major freshwater watersheds are affected by municipal stormwater runoff and stormwater pollution is on a steady rise as urban growth increases. Stormwater discharges are also increasing in more rural towns such as Granite Falls, Sultan, Stanwood, Duvall, Carnation, Snoqualmie, and North Bend, increasing potential threats to water quality in those areas as well. Among these rural growth areas, only the cities of Duvall and Granite Falls are required to follow the Department of Ecology's Phase II municipal stormwater permit at this time. All of these cities are located in areas where local waters are part of a water cleanup plan for bacterial pollution.

Wastewater treatment plants service most of the incorporated areas across the basin although there are significant areas that are still served by onsite septic systems. Ecology studies have determined that wastewater treatment plants are generally not posing localized bacterial pollution problems even in impaired waters. Onsite septic systems continue to be a primary concern. Most unincorporated areas, however, will remain on septic systems for the foreseeable future.

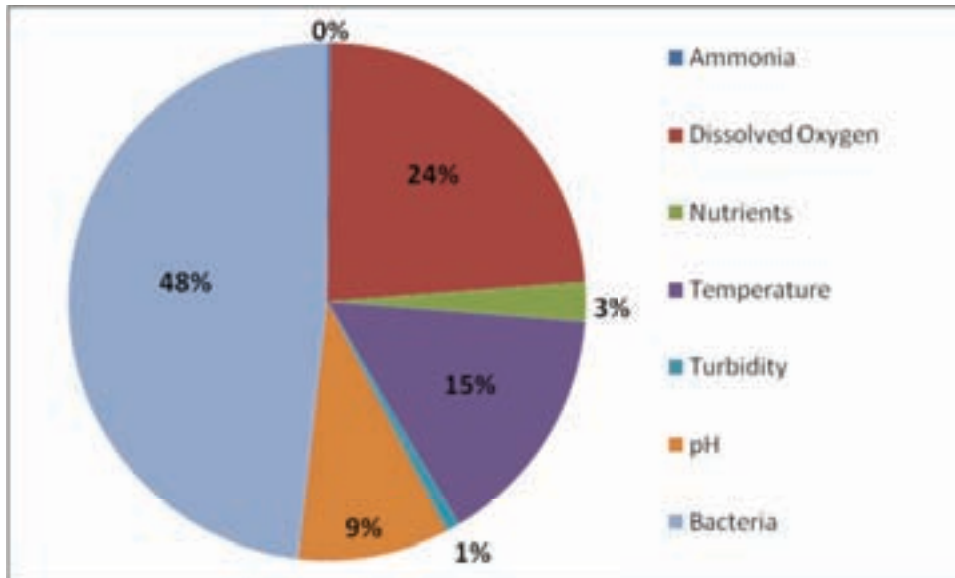


Figure 2. Types of water quality impairments in the Whidbey Basin

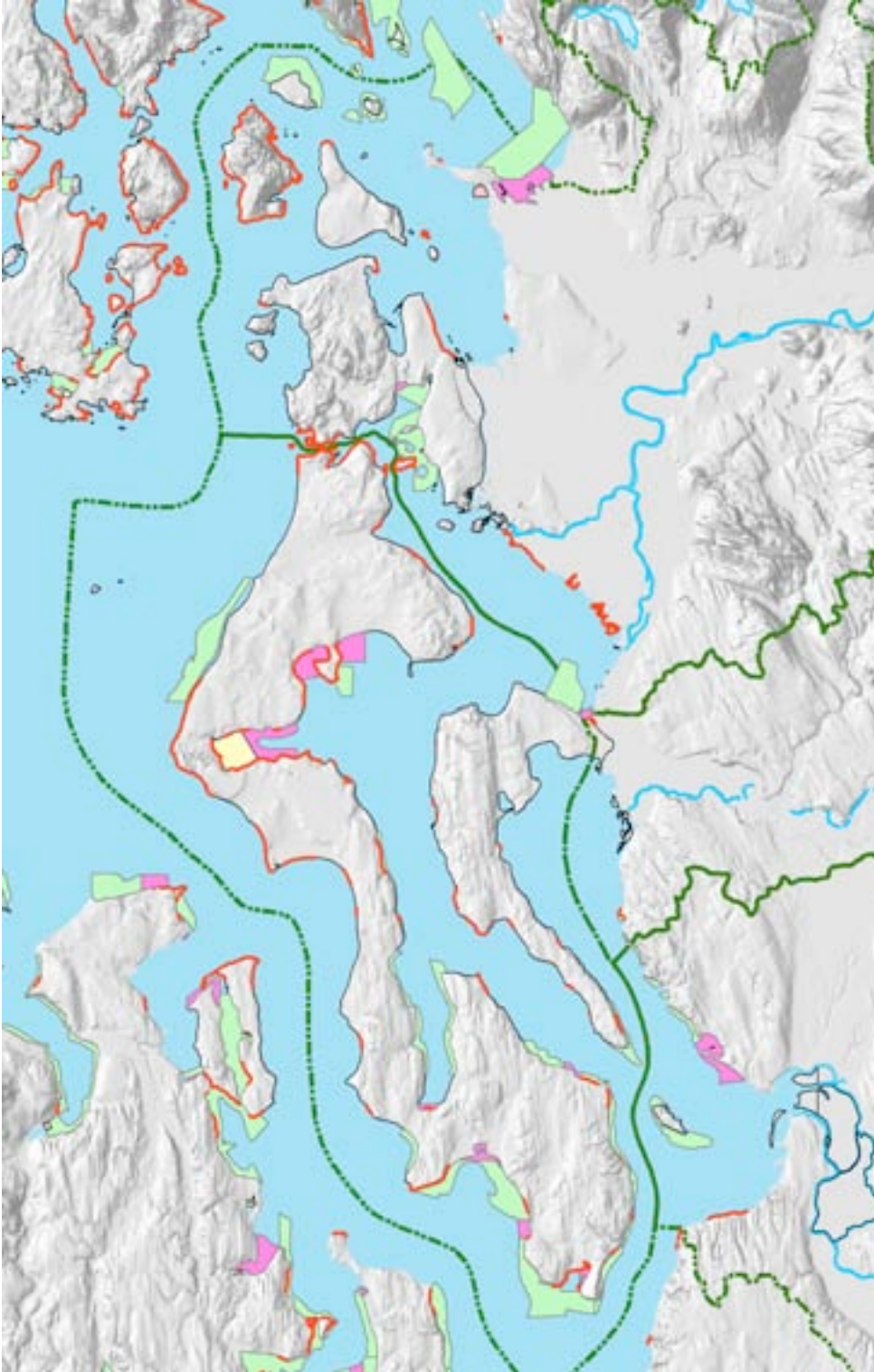


Figure 3. Commercial and Recreational Shellfish Harvest Areas. There are many opportunities for shellfish harvest in the Whidbey Basin. Red areas indicate recreational harvest opportunities. Commercial areas are shown in green (approved), yellow (conditional harvest), and pink (prohibited for commercial production).

Temperature

Temperature standards are not met seasonally in many watercourses throughout the Skagit, Stillaguamish, and Snohomish watersheds. Six tributaries of the Lower Skagit River are targeted in Ecology's Lower Skagit River Tributaries Temperature TMDL, which identifies native riparian shade as a management tool for reducing late summer stream temperatures. It also identifies a number of programs that local government and organizations should undertake to encourage buffers on private land.

The Snoqualmie Watershed has well documented high late-summer water temperatures in the mainstem and many tributaries, and sporadic areas with pH problems. Temperature concerns in the Snoqualmie prompted Ecology to prepare a temperature TMDL, which will be completed in early 2009.

Ecology's temperature TMDL for the Stillaguamish River revealed summer temperatures 21 degrees C or higher at 15 locations along the mainstem and its tributaries. Inadequate amounts of riparian forest were identified throughout the watershed. A trend analysis conducted by Snohomish County Surface Water Management shows that temperature is improving in the mainstem and tributaries of the Stillaguamish, but may be worsening in the North and South forks. Lack of riparian shading is a major factor in stream temperature exceedances.

Monitoring has not been extensive in the Skykomish Watershed and water quality is generally considered to be good due to the low levels of development. However, long term monitoring by Ecology has revealed high temperatures in the lower Skykomish during summer months. Limited monitoring in the tributaries by the forestry industry shows water temperatures are high in several forest production areas as well.

Toxics

Approximately 35% of Puget Sound sediments are classified as intermediate-quality. These are found primarily in the Whidbey Basin and Central Sound regions. Nine percent of the Whidbey Basin marine area exceeds the state's sediment quality standards and the cleanup screening levels for one or more contaminants. Chemical concentrations in Puget Sound sediments are typically greater in urban/industrialized regions, such as in Everett Harbor. There are many legacy toxics from former mill sites from up to 100 years ago, but there is also continuing toxic input to the waters of Puget Sound from both source and nonpoint sources such as stormwater.

There are several regulated and allowed toxic chemical releases in the Whidbey Basin. According to EPA's Toxics Release Inventory (TRI) approximately 850 tons of toxic chemicals were released both on and off-site to air, surface water, and land in the Whidbey Basin in 2006 alone. Some of the chemicals released from industrial processes include lead, styrene, zinc, toluene, copper, hydrochloric acid, barium, nitrate, and ammonia.

In freshwater, the pH level can increase the toxic potential of contaminants, and can also be affected by the introduction of contaminants. Stillaguamish River and tributaries fail to meet state standards for mercury and pH, and pH levels are very low throughout the Riley Slough agricultural area in the Snohomish watershed.

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Habitat and Land Use

Wetlands

The Whidbey Basin contains more than half of the historic and current wetland areas in Puget Sound. This basin has also lost over 39,000 acres of wetlands, which is more than half of the total Puget Sound wetland losses, and currently has about 18% of its historical wetlands. Much of this loss has taken place in the Skagit, Snohomish, and Stillaguamish River deltas from diking, river channel alteration, and land-use conversion, primarily for agriculture.

Estuaries

Since the late 1800s, approximately 75 percent of the Skagit estuary, more than 80 percent of the Snohomish estuary, and approximately 85 percent of the Stillaguamish estuary have been diked, cutting off tidal marshes and blind tidal channels that support a variety of species.

In the Skagit Estuary, projects have been completed or are in the planning stages that will restore tidal circulation to a hundred or more acres of diked area. Most of these opportunities lie along the South Fork of the river and elsewhere along the outer dike on Fir Island. In the Stillaguamish Estuary, The Nature Conservancy is evaluating tidal habitat restoration alternatives on their lands at the head of Port Susan.

Although much of the diked area in the Snohomish Estuary is agricultural, the land has subsided over one meter in many areas, resulting in drainage problems that constrain the economic viability of these farms. As a result, over 1,000 acres of formerly farmed areas have been acquired for restoration of tidal circulation and several hundred acres have already been converted back to tidal function, either intentionally or through natural breaching of dikes. Additional factors threaten the Snohomish River Estuary, including historic wood/sawdust accumulations around Port facilities, possible contamination (e.g., leaching from capped areas), derelict vessels, recreational boating, and potential industrial expansion such as the Cedar Grove composting site.

In Island and Snohomish counties, numerous residential developments have been constructed on sand spits that separate the Sound from salt marshes. Additional impacts to salmonid ecosystems can occur when septic systems are installed in low lying areas and experience flooding or reduced function during naturally occurring high tides.

Deltas

Approximately one third of the river deltas have been altered by development and diking. In Skagit, the diking on Fir Island has truncated the upper edge of the delta, but there is still a large area of mudflats. Approximately one fourth of the Snohomish delta has been altered by the construction of the Snohomish federal navigation channel and Jetty Island but the remaining delta has large areas of eelgrass beds and meandering channels with high habitat function for a variety of species. In the Stillaguamish, an excess of sediment has accreted in the head of Port Susan, making it more vulnerable to *Spartina* infestation.

Rivers

Most of the headwater habitat of the three major rivers is in good condition and largely protected in park and wilderness lands. Mid elevations are primarily in forestry with some protected areas, small UGAs, rural residential development, and agriculture. There is extensive agriculture in lower and mid-valley floodplains of all major rivers. All rivers in the basin have experienced effects from extensive historic logging practices.

In addition to these habitat changes, the Skagit has hydroelectric dams on the Baker River and on the Skagit mainstem upstream of Newhalem. The dams block or impair salmon migration, and have decreased salmon and fluvial trout habitat while favoring reservoir adapted species like kokanee, and rainbow and cutthroat trout. Also, the construction of the railroad and highway along the Skykomish River and roads along portions of the Skagit and Sauk rivers has created bank hardening, which limits river meander zones, accumulation of large woody debris, and diversity of habitat availability. Other habitat characteristics and changes are discussed in detail in the salmon recovery plans.

Eelgrass

Localized decline of eelgrass habitat has occurred in the Saratoga-Whidbey region. The BNSF railroad is a key factor limiting the healthy function along over 3 miles of the Snohomish watershed nearshore area between Mukilteo and Everett. Other threats include excessive sedimentation, as is occurring in Port Susan; failing septic systems, bulkheads; water quality degradation; and interruption of shoreline sediment sources and longshore transport processes.

Forest Cover

Although forest cover at mid to upper elevations, above 2,000 feet, is moderate to good, the Whidbey Basin has seen a reduced level of mature forest and a reduction in habitat types due to mono-cultures in some of the commercially replanted forests, which can impact stream hydrology. Large wood sources for river systems are limited in middle and lower elevations as a result of degraded riparian zones and a consequent lack of large wood and associated log jams, which reduces pool area in many stream reaches.

Aquatic habitat has suffered an excess of sediment, nutrients, and solar energy; and has in many places been confined by humans and disconnected from its riparian zone. In all of the major rivers, especially in the floodplains, there is much development, with bank hardening, sedimentation that can affect survival-to-emergence of salmon, and reduced riparian zones causing high stream temperatures.

Invasive Species

Infestations of the introduced cordgrass, *Spartina* spp., have been greatly reduced recently in many areas, but it continues to thrive in some areas as seen in Figure 4. The Nature Conservancy staff and volunteers have made great strides to control *Spartina anglica* in Port Susan Bay. Much of the estimated 100 solid acres that infested more than 2,000 acres of estuarine mudflat and marsh in 1997 has been eliminated. Only about two solid acres still remain scattered across the area. The Conservancy is also focused on

removal of non-native species such as gorse, Scotch broom and English ivy at Ebey's Landing.

Japanese knotweed has invaded rapidly in the Skagit, Samish, and Snohomish watersheds. Efforts are underway by the Washington State Department of Agriculture to attempt to eradicate these species. People for Puget Sound, WSU Beach Watchers, the Stilly-Snohomish Fisheries Task Force, and the Snohomish Camano Nearshore Cooperative, among others, have organized volunteer work parties to control invasive species and to plant native species at several public areas in the Basin (e.g., Jetty Island, Union Slough, Kayak Point).

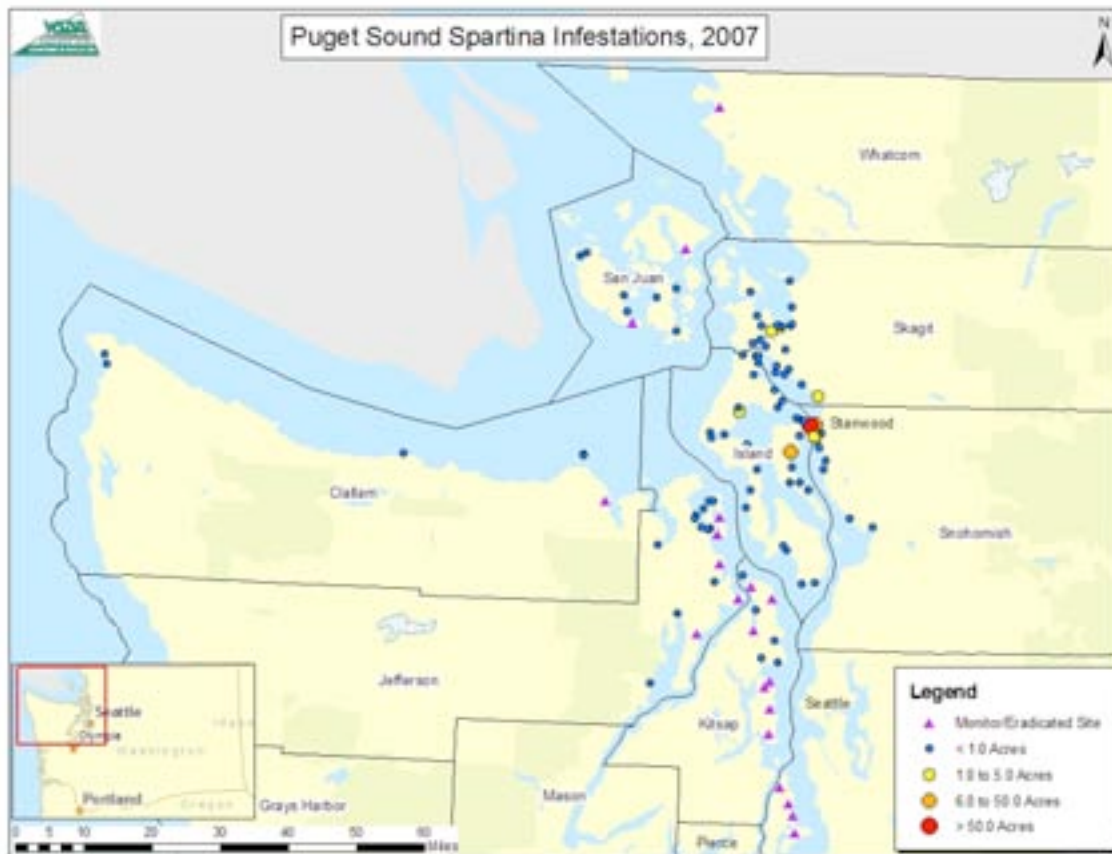


Figure 4. Puget Sound Spartina Infestations, 2007

Climate Change

Climate change and its impacts threaten our drinking water supplies, forests and rivers, wildlife, agriculture production, viability of shorelines and low-lying lands, and the health of future generations. Scientists predict that the Puget Sound region will face higher average air and water temperatures, shifts in precipitation patterns, a significant decline in snow pack, earlier peak spring streamflows and lower summer streamflows. Global warming will also contribute to significant increases in the rate of sea-level rise due to the thermal expansion of ocean waters and melting of glaciers and ice fields.

River Flows

Early research by climate change scientists suggests that as global warming proceeds, the Skagit River will flow higher in the flood-prone winter months and lower in the summer, when salmon, farmers and water purveyors such as the Skagit PUD and the City of Anacortes need it most. Because less water will be stored in the mountains as snow to feed the river in the late spring and summer, the model predicts more flow (runoff) from winter rains and less flow (from snow melt) in summer. Models of the Skagit predict flows will decrease by 23 percent from April to September due to reduced snow pack. The river's flow rate is already prone to fall below 10,000 cubic feet per second in August and September, months when the state's instream flow rule sets aside 10,000 cfs as a water right for the salmon. Similar, but less pronounced changes are likely in the other river systems in the basin.

Sea level rise

Sea level rise in Puget Sound depends not only on thermal expansion of the oceans and melting glaciers and polar ice sheets, but also on subsidence and uplift (including crustal rebound from the last ice age), sedimentation, and marsh accretion. In north Puget Sound, vertical land movement is close to zero. If local subsidence and uplift rates continue on current trends, sea level rise in the Whidbey basin is expected to increase between 8 and 24 inches by 2100. Low-lying areas such as La Conner and the Swinomish Reservation as well as diked agricultural lands in the estuaries, could be the first to experience the impact of sea level rise. This could significantly strain the area's drainage system, consisting of roughly 147 miles of levees and dikes and nearly 380 miles of drainage ditches, which protect approximately 55,000 acres of land from flooding and high tides in the Skagit alone.

Higher sea level means saltwater may penetrate wells in low-lying communities, reducing the availability of freshwater for coastal communities. In particular, seawater intrusion, the movement of marine saltwater into freshwater aquifers, could become a serious problem in areas such as Island County.

The National Wildlife Federation recently used a simulation model to analyze the potential impacts of a 27.3-inch sea-level rise by 2100 on coastal habitats in the Pacific Northwest. The results indicate the region is likely to face significant changes in the extent and diversity of its coastal marshes, swamps, beaches, and other habitats due to sea-level rise. In particular, brackish marshes and beaches at Skagit Bay and Port Susan

are expected to be converted to salt marshes and tidal flats. A combination of inundation and erosion is predicted to have significant effects on beaches, especially on western Whidbey Island. For the Snohomish Estuary, the region faces a significant loss of tidal swamp and estuarine beaches. In addition, significant changes are predicted due to the inundation of brackish marsh and inland fresh marsh.

Forestry and Agriculture

In the next 10 to 20 years, mortality of plants and trees are projected to increase due to insects, increased temperature and lack of groundwater in summer. Tree growth impacts from climate change will differ according to elevation. Sub-alpine forests could benefit from longer, warmer growing seasons and shorter snow pack duration. In mid-elevation forests, the impact of warmer summers and lower snow pack on growth will depend on precipitation change. In contrast, in low-elevation forests, warmer summers and potentially less summer precipitation could lead to a large growth decline. Regional forests face increased fire risk as a result of hotter and drier summers, dead trees, summer groundwater shortage and reduced soil moisture.

In the next 50 years, Whidbey Basin farmers could see the direct impacts of climate change through longer growing seasons, drier summers, wetter winters and changing behavior among pests, weeds and diseases. About 10,000 acres of farmland are irrigated each summer. Water quantities for irrigation are already a concern. The biggest direct impact all growers could face stems from diseases, weeds and pests.

Climate change modeling and analysis has not been formally incorporated into the watershed planning efforts (including salmon conservation plans) and could be a major factor determining future functions of habitats and the effectiveness of species recovery efforts.

the Skagit is likely the most vulnerable watershed in the Puget Sound to climate change impacts because the large snow pack and numerous glaciers in this watershed. The historically large snow pack and glaciers are critical to the hydrologic, geomorphologic, and biological processes that form and maintain the diverse stream, river floodplain, tidal marsh, and estuary ecosystems in the Skagit watershed. The snow-dominated precipitation patterns are also important to the diverse terrestrial ecosystem found in the upper Skagit watershed.

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Human Health

Bacteria and Biotoxins

The immediate threats to human health in Puget Sound include bacteria and biotoxins such as paralytic shellfish poisoning and domoic acid. Bacteria and/or biotoxins can be found in a variety of shellfish, including crabs, clams, and oysters. While bacteria can be rendered harmless by thorough cooking of seafood, biotoxins cannot be removed by cooking and represent a serious threat to the health and survival of anyone consuming them. Biotoxins are not necessarily related to water pollution. The Washington State Department of Health (DOH) is responsible for monitoring shellfish beds, fish contaminants, and swimming beaches. DOH restricts or prohibits seafood harvest based on bacterial levels or the presence of toxins; issues fish consumption advisories based on contaminant levels; and closes swimming beaches when bacterial levels are high.

Many shellfish growing areas, recreational shellfish beaches, and swimming beaches in the Whidbey Basin are closed or have use restrictions due to bacteria and/or biotoxins. Areas normally open are subject to emergency closure due to bacterial loading from freshwater sources, as has occurred in Samish Bay twice in the spring of 2008. At least 11 areas in the Whidbey Basin are currently closed to commercial shellfish harvest, including parts of Samish and Skagit Bays, Oak Harbor, and Penn Cove, as well as portions of many smaller bays. The entire eastern shore of Puget Sound is closed for commercial shellfish harvest from Marysville to Tacoma.

At least 37 public beaches are currently closed to recreational shellfish harvest in the Whidbey Basin. The majority of these are closed due to bacterial pollution, but many others are closed because of biotoxin levels in the shellfish. Many additional areas have harvest advisories posted, asking consumers to thoroughly cook shellfish due to the possibility of bacterial contamination. There are currently no closed swimming beaches in the Whidbey Basin, but several beaches have cautions listed due to bacterial levels. (See Water Quality section for additional information on bacterial contamination and shellfish and beach closure areas.)

Toxic Contaminants

Longer-term threats include the buildup of bioaccumulative materials in fish tissue, which are then transferred to humans when the fish are eaten. Polychlorinated biphenyls (PCBs) and mercury are the main chemicals of concern in Puget Sound fish. The use of these “legacy” chemicals has been banned for many years, but they continue to appear in our fish.

New threats to human and wildlife health may come from “Emerging Contaminants.” These are substances which are beginning to be detected in the environment, but because of a lack of information the threat posed by these contaminants is unknown at this point. Fire retardants (PBDEs) and human pharmaceuticals are two examples of emerging contaminants which have received recent attention.

Fish consumption advisories based on PCB and mercury levels are in place for Chinook salmon and rockfish throughout the Whidbey Basin, and for flatfish in some areas. These generally take the form of advisories on the number of meals that can be safely eaten in a given period of time. Certain populations such as Native Americans and some immigrant groups traditionally rely on seafood to a greater extent than the general population, and in so doing may greatly exceed the recommended consumption levels. In addition, if fish consumption advisories are followed, it may represent a reduction in the availability of what was commonly thought of as a healthy food source. This shortage of food may pose health threats as well.

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Species and Biodiversity

Species decline is significant throughout Puget Sound and within the Whidbey Basin. This is largely due to the effects of habitat alteration, impacts to surface water flows, pollution, harvest, cultured species, and invasive species. Much is known about marine and freshwater fishes and mammals and information about the current status and concerns are listed below. Less is known about recent declines in sea bird populations, but status information is provided where available.

Marine Fish: In most cases, where the population structure for marine fish species is known, their range is larger than the Whidbey basin action area.

Species/Assemblage: Pacific hake (a.k.a. Pacific whiting) *Merluccius productus*

- Federal: NOAA Species of Concern (1999) (see http://www.nmfs.noaa.gov/pr/pdfs/species/pacifichake_detailed.pdf, updated Nov. 1, 2007) Biological Review Team (BRT) review (Gustafson et al. 2000) recommended not listing but expressed concern, were divided as to status and called for further monitoring.
- State: Candidate species (see <http://wdfw.wa.gov/wlm/diversty/soc/soc.htm>)
- Port Susan is an important spawning area for the Georgia Basin distinct population segment (DPS) of Pacific hake. The biomass of hake spawning in Port Susan declined by 85% from 1985-2000, and individual fish size and size and age at maturity decreased “substantially” (Gustafson et al. 2000). WDFW has not monitored this population since 2002 (Wayne Palsson, WDFW, personal communication to Kit Rawson 24 April 2008).
- Threats to Pacific hake
 - NOAA cites overfishing as the major threat. Recreational and commercial fishing for hake in Puget Sound have been closed since 1991.
 - Predation by pinnipeds (sea lions and harbor seals) was considered by NOAA but found hard to estimate accurately. So the magnitude of this threat is uncertain.

Species/Assemblage: Rockfish (*Sebastes spp.*)

- Federal: Quillback (*S. maliger*), copper (*S. caurinus*), and brown (*S. auriculatus*) rockfish are NOAA Species of Concern
- BRT review of copper, quillback, and brown rockfish recommended not listing but expressed concern. New information provided in 2007 resulted in NOAA agreeing to reconvene the BRT.
- State: 13 rockfish are state Candidate species (see <http://wdfw.wa.gov/wlm/diversty/soc/soc.htm>)
- For threats and other details see “The Biology and Assessment of Rockfishes in Puget Sound”, WDFW, to be available in August 2008.

Species/Assemblage: Pacific cod *Gadus macrocephalus*

- Federal: NOAA has accepted a petition to review them for listing under ESA (March 2008)

- BRT review (Gustafson et al. 2000) recommended not listing but expressed concern and were divided as to status.
- State: Candidate species (see <http://wdfw.wa.gov/wlm/diversty/soc/soc.htm>)
- Threats include:
 - Warmer oceanographic regime (Palsson 1990);
 - Pinneped predation (Palsson 1990)
 - Predation by yearling hatchery Chinook (Gustafson et al. 2000)
 - Increasing fishing pressure (Palsson 1990) (this has since been reversed)
 - Declines in prey species (herring and pollock) (West 1997)
 - Loss of spawning areas (none of these is in the Whidbey Basin, though)

Species/Assemblage: Pacific herring *Clupea pallasii*

- Within the Whidbey Basin herring spawn in Fidalgo Bay, on the west side of Skagit Bay, both side of Port Susan Bay and in Holmes Harbor (Stick 2005). The Skagit Bay and Holmes Harbor stocks are currently rated as healthy, while the Port Susan stock is considered depressed (Stick 2005).
- Threats include:
 - Commercial fishery for sport bait
 - Warm water temperatures during spawning and incubation
 - Increasing pinneped predation
 - Other sources of increasing natural mortality

Salmonids

Species/Assemblage: Chinook salmon (*Oncorhynchus tshawytscha*)

- Federal: Puget Sound Chinook ESU listed as threatened under ESA (1999)
- State: Candidate species (see <http://wdfw.wa.gov/wlm/diversty/soc/soc.htm>)
- 10 (of 22 overall) populations of Puget Sound Chinook salmon spawn in Whidbey Basin rivers. Status ranges from relatively robust, although below recovery goals, to nearly extinct (S. Fork Stillaguamish). Most are currently at 10% to 25% of the abundance expected under recovered conditions.
- Threats include (see Puget Sound Salmon Recovery Plan for more detail and watershed-specific threats, see also (Puget Sound Salmon Stock Review Group 1997))
 - Loss of estuary rearing habitat due to diking, draining, and filling
 - Loss of mainstem side channel habitat due to diking, draining and filling and also due to inhibition of natural river erosion processes
 - Increased sediment load due to higher than natural landslide frequency from forest practices
 - Change in hydrograph (increased frequency and higher level of high flows and lower low flows) due to higher than natural percentage of land that is non-permeable surface
 - Secular increase in level of annual peak flows (mainly North Fork Stillaguamish River)

- Loss of quantity and quality of rearing habitat due to lower than natural level of large wood jams and accumulation along streambanks
- Change in pool/riffle ratio and quality of pools and riffles due to lower than natural frequency of natural logjams in rivers
- Loss and degradation of “pocket estuaries” and associated small coastal streams
- Degradation of shoreline habitats and the processes that form and maintain them from greater than natural levels of shoreline armoring
- Inhibition of juvenile salmon migration pathways along shore due to overwater structures
- Loss of eelgrass beds
- Introgression of genes from hatchery-reared fish into natural populations
- Ecological interaction (competition and predation) between hatchery Chinook, coho, and steelhead and natural-origin Chinook
- Harvest of natural origin Chinook incidental to fisheries directed at hatchery Chinook and non-Chinook species

Species/Assemblage: Coho salmon *Oncorhynchus kisutch*

- Federal: NOAA Species of Concern (1997) (see http://www.nmfs.noaa.gov/pr/pdfs/species/cohosalmon_detailed.pdf, updated Nov. 2, 2007)
- Puget Sound coho salmon terminal runs declined in abundance by 85% between 1935 and 1975 (Bledsoe, Somerton, and Lynde 1989). Of 8 coho stocks that spawn in Whidbey Basin rivers, 3 were considered to be in depressed condition, 2 in unknown condition, and 3 in healthy condition in the early 1990s (Washington Dept. of Fisheries., Washington Dept. of Wildlife., and Western Washington Treaty Indian Tribes 1993). The condition of these stocks has not appreciably changed since then, although abundances fluctuate. Overall natural coho escapements have increased in the Whidbey basin since 1993.
- Potential threats to coho in the Whidbey Basin include:
 - Competition between hatchery and wild coho and predation of hatchery coho, Chinook, and steelhead yearlings on smaller coho.
 - Harvest.
 - Increased sedimentation and loss of habitat quality and quantity from forest practices.
 - Reduction of lowland stream rearing habitat quantity and quality due to conversion of land to residential, commercial, and agricultural uses (Beechie et al. 1994) and resulting decreases in forest cover and increases in impervious area.
 - Loss of spawning and rearing habitat due to dams associated with hydropower projects.
 - Pollution

- Blockage of habitats due to culverts that do not pass fish (cited by tribes in federal court)
http://www.nmfs.noaa.gov/pr/pdfs/species/cohosalmon_detailed.pdf
- Climate change

Species/Assemblage: Chum salmon *Oncorhynchus keta*

- Of 8 chum stocks that spawn in Whidbey Basin rivers, none were considered to be in depressed condition, 2 in unknown condition, and 6 in healthy condition in the early 1990s (Washington Dept. of Fisheries., Washington Dept. of Wildlife., and Western Washington Treaty Indian Tribes 1993). The condition of these stocks has not appreciably changed since then, except that the Snoqualmie stock, previously considered to be of unknown status, would probably now be considered healthy.
- In the Whidbey Basin all chum salmon are normal, or fall-timed, returning to rivers to spawn from mid-October through November. In this area chum salmon typically show an odd-even year fluctuation in abundance, with the even-numbered years being stronger.
- Overharvest is a potential threat because there are significant marine commercial fisheries and freshwater recreational fisheries conducted on chum salmon in the Whidbey Basin. However, chum salmon abundances in the basin have remained stable or increased since the 1990s.

Species/Assemblage: Pink salmon *Oncorhynchus gorbuscha*

- All 5 pink stocks that spawn in Whidbey Basin rivers were considered to be in healthy condition in the early 1990s (Washington Dept. of Fisheries., Washington Dept. of Wildlife., and Western Washington Treaty Indian Tribes 1993). The condition of these stocks has not appreciably changed since then.
- In the Whidbey Basin, 4 of the pink stocks return in odd-numbered years only. The Snohomish even year pink stock was the unique even-year returning pink salmon group in the early 1990s. Since then, however, even year pink returns have been increasing in the Stillaguamish and Skagit watersheds as well.
- Overharvest is a potential threat because there are significant marine commercial and recreational fisheries and freshwater recreational fisheries conducted on pink salmon in the Whidbey Basin. However, pink salmon abundances in the basin have remained stable or increased since the 1990s, suggesting that fisheries management is working well.

Species/Assemblage: Sockeye salmon *Oncorhynchus nerka*

- The Baker River sockeye is the only identified sockeye stock that spawns in Whidbey Basin. Its status was considered to be in critical condition in the early 1990s (Washington Dept. of Fisheries., Washington Dept. of Wildlife., and Western Washington Treaty Indian Tribes 1993). Since then the status of Baker river sockeye has improved to the point where there are harvestable numbers expected in 2008.

- Because the spawning habitat of the Baker River sockeye was inundated by the construction of two dams, a trap and haul operation (i.e., returning adult fish are trapped near the base of the dam and transported by truck to areas upstream) and maintenance of artificial spawning beaches are necessary for this stock's survival.
- Threats include mortality of juveniles passing downstream through the dam during outmigration. Attempts to trap and transport juveniles and thus bypass the dams have been only marginally successful to date.
- There are also "river sockeye" that spawn in parts of the Skagit, Stillaguamish, and Snohomish watersheds (see <http://wdfw.wa.gov/fish/sockeye/riverpuget.htm>).

Species/Assemblage: Steelhead trout *Oncorhynchus mykiss*

- Federal: Puget Sound steelhead ESU listed as threatened under the ESA (2007)
- The co-managers delineated 9 stocks of summer run steelhead and 7 stocks of winter run steelhead that spawn in the rivers draining into the Whidbey Basin (Washington Dept. of Fisheries., Washington Dept. of Wildlife., and Western Washington Treaty Indian Tribes 1993). The Snohomish watershed Recovery Technical Committee commissioned a report (R2 Resource Consultants 2008) that reviews abundance data and harvest and hatchery information for steelhead in the Snohomish watershed.
- Wild steelhead have declined despite great decreases in harvest levels (Hard et al. 2007)
- Risk Factors: (Hard et al. 2007)
 - Recent declines in abundance and productivity in the previously robust Skagit and Snohomish winter run stocks.
 - Critically low abundance for many summer run stocks
 - General decline in recruits per spawner

Marine Mammals

Species/Assemblage: Gray whales *Eschrichtius robustus*

- State: Sensitive species
- A small group (6-10 individuals) of gray whales spend spring and summer feeding on ghost shrimp and tubeworms on beaches and subtidal zones on southern Whidbey and Camano Islands and the east side of Port Susan (Weitkamp et al. 1992) as well as other areas such as the east side of Possession Sound. Other gray whales sometimes wander into the Whidbey Basin area already emaciated from poor ocean feeding conditions. These whales, not familiar with the available food resources sometimes are found dead and stranded on the beach.
(<http://www.orcanetwork.org/nathist/graywhales.html>)
- Potential risk factors for gray whales in the Whidbey basin include entanglement in fishing gear, concentration of anthropogenic contaminants, and loss of feeding habitat. In the late 1990s none of these was thought to

pose significant risk to resident gray whales in Puget Sound (Richardson 1997).

Species/Assemblage: Orca whales *Orcinus orca*

- Federal: Southern resident distinct population segment listed as endangered under the ESA (2005, see <http://www.nwr.noaa.gov/Marine-Mammals/Whales-Dolphins-Porpoise/Killer-Whales/ESA-Status/Orca-Recovery-Plan.cfm>)
- State: Endangered species

[Most of the information below can be found in the Southern Resident Killer Whale recovery plan (National Marine Fisheries Service 2008)]

- Orca whales consist of residents, which mainly feed on salmon and other fish and spend spring and summer in Washington waters, and transients, which mainly feed on pinnipeds. Both types are found in Whidbey Basin waters.
- The population of southern resident orcas declined by 20% from 1996 to 2001, after an increase from the late 1970s to the mid-1990s, prompting the petition to list.
- The orca whale is the symbol of the Tulalip Tribes.
- Principal threats include (National Marine Fisheries Service 2008):
 - Decreased prey availability (Chinook salmon, other salmon, herring)
 - Pollution/contamination
 - Noise and other vessel effects
 - Acoustic effects from other anthropogenic sounds
 - Chronic oil spills and the risk of large oil spills

Bivalves

- **Species/Assemblage:** Clams, oysters, and mussels .
 - Hardshell clams: native littlenecks *Protothaca staminea*, manila clams (non-native) *Venerupis philippinarum*, butter clam *Saxidomus gigantea*;
 - Eastern softshell (likely non-native) *Mya arenaria* and horse clams *Tresus* spp.
 - Pacific oyster (non-native) *Crassostrea gigas*
 - Blue mussel (*Mytilus trossulus*)
- These species are common on beaches in the Whidbey Basin and are all harvested to one degree or another for food and bait.
- These bivalves are filter feeders, consuming diatoms, detritus, and other plankton (Dethier 2006)
- Gravel in beaches can help provide hardshelled clams with protection from wave action and predators (Dethier 2006)
- Identified threats (Dethier 2006):
 - Loss or alteration of beach habitat due to disruption of coastal processes that create and maintain them. Important processes include: sediment transport from source areas to deposit areas which can be impeded by armoring; and freshwater runoff and seepage into beaches

which can be impeded by upland water withdrawals and loss of shoreside buffer vegetation.

- Degraded water quality (especially fecal coliform; occasionally red tides) that render bivalves unfit for human consumption.
- Overharvest, especially near public shoreline access points

Additional Species to consider adding

Sea Birds, California Sea lions, harbor seals, river otters, beavers, muskrat

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Water Quantity

In a land of abundant water, there is often a need for more or at least improved management of water usage. All watersheds have competing needs and water right concerns. Agriculture production often needs water in the dry periods for crop production, while salmon and other freshwater species need water for survival.

Stillaguamish and Samish River instream flow studies show that flow impairments limit salmonid rearing habitat. Current municipal and commercial uses are being met through exempt wells and existing water rights. Ecology is not processing new water rights. In the Skagit River there are areas in the basin that are categorized as flow-limited. Water withdrawals are limited under the instream flow rule but can still affect flows. Dam operations have been modified under FERC licenses to be more fish-friendly, but still impact flows.

In the Stillaguamish River the Low Flow Assessment lists WRIA 5 as impaired by flows. The Department of Ecology adopted an Instream Resource Protection Program (IRPP) in 2005 for the Stillaguamish watershed. Low flows strongly limit rearing habitat in some reaches. River gage records also show that peak flows on the Stillaguamish River have increased sharply since 1980. On the North Fork, only one flood exceeded 30,000 cfs in the 51 years prior to 1980. Since then, flows have exceeded 30,000 cfs in 15 of the 27 years. It is expected that climate change and continued development will result in higher peak flows, less snow pack and consequent lower spring runoff and summer flows.

The Snohomish River has similar concerns with low flows being a limiting factor in many reaches for rearing habitat. The instream flow is frequently not met. In all three major river basins the current threats are primarily water withdrawals, impervious surfaces, diking and draining, and forest conversion. Future threats for are primarily climate change, population growth, increased water withdrawals, and loss of native landscape.

Importantly, for both high flows and low flows alike, the effect of changes in the hydrograph also depend on the shape and condition of the river channel. For example, in the case of high flows, river channels that have been diked, armored or otherwise constrained will tend to have higher velocities than reaches where the river has rougher, natural banks and is able to spill more easily into its natural floodplain. Exceedingly high water velocities can be harmful to incubating salmon eggs in some circumstances. Similarly, many stream channels have become wider and shallower as a result of land-use practices and excess sediment input. In these situations, temperature and depth are compromised during low summer flows with serious implications for rearing habitat.

Most potable water in Island County comes from groundwater. Some wells near the shoreline have experience seawater intrusion. Other areas appear to have adequate freshwater supplies. Ecology is currently processing new water rights in WRIA 6. Current threats in Island County are water withdrawals, seawater intrusion, impervious surface and loss of native landscape, which lowers recharge capacity of the land.

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Quality of Life

Puget Sound plays a vital role in the quality of life for the people who live here. Its health or lack thereof, has direct relevance to quality of life in each of the topic areas. Whether it is having the privilege and opportunity to dig for clams, fish for crab and salmon, or enjoy a day swimming at the beach. Or perhaps the aesthetic pleasure of seeing wildlife, breathing clean air, or walking in a forest. It could also mean having a greater sense of community, a shorter commute time, or a healthy economy. Whichever way it is defined it is challenging to measure, and yet imperative to evaluate in the development of action agenda priorities.

All of the threats and concerns discussed so far have implications for quality of life. Recreational and shellfish beach closures, toxic contaminants in the air and water, and decline of habitat and species all tie directly to economic, social, and aesthetic values. Quantifying these can provide some measurement of quality of life, but it is not comprehensive. A more deliberate process is needed that considers all types of capital as well as ecosystem services.

Capital that is usually measured includes financial capital, such as money and other liquid assets; built capital, such as durable consumer goods; and human capital, such as labor. Types of capital that are not generally measured, and consequently not usually taken into consideration when deciding management priorities, are other types of human capital, such as individual minds, bodies, and spirits; social capital, such as the strength of networks and communities; and natural capital, such as ecosystem resources.

Ecosystem services are becoming fairly well documented and some measures have been developed. An example of an ecosystem service could be the flow of water through a watershed that provides clean drinking water for people, water for aquatic wildlife, and the growth of plants that in part regulate our climate.

Another difficulty in measuring quality of life is that many of the parameters, as they are interpreted, can be conflicting. For instance, aquaculture provides food that many enjoy but can also be detrimental to aesthetic values. Understanding the system dynamics of ecology, economy, and society and developing meaningful measures and priorities is one of the challenges of the Partnership's current efforts in developing the Action Agenda. A synthesis of quality of life implications is being developed by the Partnership for the entire Puget Sound region and may be adapted for the Whidbey Basin.

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Existing Priority Actions

The following priorities are taken from existing studies and reports. They are not listed in any prioritized order and this is not an exhaustive list. Some of the gaps are being addressed and will be discussed at the technical work session. These tables are in the process of being further refined and reformatted to make them more user-friendly.

Water Quality

Proposed Priority Actions	Key Planning Documents and Work Plans
<p>Island County</p> <ul style="list-style-type: none">• Island County should control stormwater using the latest version of the Ecology stormwater manual (or an equivalent manual) with a special emphasis on promoting LID practices• Island County Health Department should implement new State Department of Health on-site sewage treatment requirements and continue risk-based on-site program management• Snohomish Conservation District and WSU Extension should expand their education, outreach, technical assistance, and cost-share programs for small farms and commercial agriculture• County should provide water quality improvement incentives for homeowners and businesses• County should seek transfer of forest practices jurisdiction from WDNR to County• County should continue funding water quality monitoring program• County should update CAO to include BAS-based buffers• State Parks and volunteer organizations should implement boater education programs to prevent pollution and invasive species• County should continue to provide leadership to local communities to protect water quality through the Holmes Harbor Shellfish Protection District and other targeted efforts as polluted waters are identified.	<p>Camano Island Nonpoint Pollution Prevention Plan 2007</p>

<p>Skagit and Samish watersheds</p> <ul style="list-style-type: none"> • Locate funding to continue WQ monitoring (1) • Conduct wet season stormwater monitoring in selected location(s) (1) • Continue to educate landowners on septic system issues (1) • Work with ECY on nonpoint enforcement (1) • All local entities should: (1) <ul style="list-style-type: none"> ○ Promote LID practices ○ Work with ECY on nonpoint enforcement ○ Implement NPDES Phase II stormwater requirements • Multiple parties: protect existing riparian vegetation and increase overall quantity of mature riparian vegetation (7) • Multiple parties: promote groundwater connections with streams and reduced water use during critical periods (7) • DOH should conduct shoreline survey of South Skagit Bay (1) • State should allocate funding for WQ projects in the Lower Skagit and South Skagit Bay (1) • Local organizations develop funds for Basin Stewards to work with landowners on riparian vegetation and stream health improvements (7) • Skagit County should include Lower Skagit Tributaries Temperature TMDL as Best Available Science in updates of Critical Areas Ordinance for Fish & Wildlife Habitat on Ongoing Ag Lands (7) 	<p>1. Lower Skagit River Fecal Coliform TMDL Implementation Plan</p> <p>7. Lower Skagit Tributaries Temperature TMDL Water Quality Improvement Report</p> <p>Samish Bay Watershed Fecal Coliform TMDL Study and Plan (draft in preparation)</p>
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<p>Snohomish watershed</p> <ul style="list-style-type: none"> • Wastewater treatment plants (WWTPs) must be operated to maximize pollutant removal. WWTPs must continue to meet effluent requirements (3). • WSDA must inspect dairies regularly and work with Ecology on enforcement as needed. • Ecology must inspect wastewater treatment plants, construction sites, and industrial stormwater sites, provide technical assistance, and perform enforcement as needed. Audits of municipal stormwater programs and enforcement of permit conditions must also continue. • Local authorities should develop (as needed) and enforce regulations to protect local surface waters from pollution. Compliance activities should be tracked and reported annually to the public. • Multiple agencies: Education and outreach on LID, OSSs, bacterial pollution (4) • Local health districts should perform sanitary surveys in areas with a high potential for onsite septic system failures. Results from the ongoing pilot study performed by Snohomish County and the Snohomish Health District should be reviewed and adapted locally as needed. • Municipal stormwater permittees must ensure there are adequate resources to perform pollution source tracking when stormwater outfall monitoring reveals a significant pollution problem. Pollution source tracking activities should be tracked and reported annually to the public. • Local governments should prepare a long-term LID retrofit program. The results of the Snohomish County Integrated Stormwater Management Pilot Project be reviewed and modified locally as needed. • Conservation districts should identify all local farms with a potential to pollute surface waters and develop and implement farm plans. 	<p>3. Snohomish River Estuary TMDL Submittal Report</p> <p>4. Lower Snohomish River Tributaries Fecal Coliform Bacteria TMDL - Detailed Implementation Plan</p> <p>5. Snoqualmie River Multi-Parameter TMDL WQ Effectiveness Monitoring Report</p>
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<ul style="list-style-type: none"> • Aggressive implementation of known best management practices in agricultural areas and small farms is essential. Where the Conservation Reserve Enhancement Program (CREP) and other current voluntary • Snoqualmie Watershed Forum should incorporate WQ improvement into current activities (5) • King County to continue GMA revisions, outreach to ag community, salmon recovery, enforcement (5) • The Snoqualmie Tribe, Tulalip Tribes, and nonprofit environmental organizations should continue to work together closely with local governments and citizens to reduce pollutant inputs to surface waters and improve the quality of riparian vegetation across the Snohomish Watershed. • Surface water quality monitoring is needed in all major subbasins. Fresh water areas in Snohomish County are currently well covered. The Snoqualmie Watershed needs additional commitment by local governments to track long-term water quality trends. Flexible source identification monitoring resources are needed in all parts of the watershed. <p>Stillaguamish watershed</p> <ul style="list-style-type: none"> • Stillaguamish watershed – WWTPs to meet temperature limits • Multiple parties: protect existing riparian vegetation and increase overall quantity of mature riparian vegetation • Address floodplain and drainage needs that support sustainable agriculture and provide adequate infrastructure for development • Improve water quality at Warm Beach • Educate homeowners and the general public and provide technical assistance to improve stewardship and implement best management practices 	<p>Stillaguamish River Watershed Temperature TMDL Water Quality Improvement Report - Vol. 2: Implementation Strategy</p> <p>State of the Stilly, 2007</p> <p>Puget Sound Salmon Conservation Plan</p>
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Habitats Protected and Restored

(See Species Section for additional information)

Proposed Priority Actions	Key Planning Documents and Work Plans
<p>Snohomish/WRIA 7 Priorities:</p> <ul style="list-style-type: none"> • Protect and restore existing nearshore habitat • Protect existing functional habitat (highest priority). • Encourage negotiations with BNSF regarding beach nourishment (as at Mt. Baker Terminal in Everett), wetland stewardship, stream culvert improvements, and other restoration efforts, such as the Malsby marsh • Reconnect smaller streams with the Puget Sound and increase large woody debris • Continue stewardship of Jetty Island to increase native vegetation and expand the island's shoreline south along the jetty • Restore approximately 1,400 acres of tidal marsh habitat in the Snohomish River on publicly-owned lands identified with good habitat potential • Restore pocket estuaries • Implement habitat restoration programs and projects as outlined in 3-year workplans derived from the Chinook recovery chapters. • Seek funding and other resources necessary to implement projects at the rates originally called for in the salmon recovery plan. <p>Stillaguamish/WRIA 5 Priorities:</p> <ul style="list-style-type: none"> • Implement Capital projects on 3-year work plan • Bring together local elected officials for Policy discussions relating to the recovery plan • Establish a floodplain management plan to identify actions mutually beneficial for Puget Sound recovery and agricultural uses over time. • Analyze habitat protection success <p>Skagit/WRIAs 3 and 4</p> <ul style="list-style-type: none"> • Implement Capital projects on 3-year work plan <p>Island/WRIA 6</p>	<p>Puget Sound Salmon Recovery Plan and associated 3-year work plans.</p>

Healthy Human Populations

Proposed Priority Actions	Key Planning Documents and Work Plans
<ul style="list-style-type: none"> • Open all commercial and recreational shellfish beds to harvest. <ul style="list-style-type: none"> ○ # of beds • Open recreational swimming beaches. <ul style="list-style-type: none"> ○ <i>How many are closed?</i> • Clean up polluted water bodies on Ecology's Category 5 (303(d)) list. The list includes <ul style="list-style-type: none"> ○ 105 streams known to be polluted ○ 235 different water segments known to be polluted 	<p>State of the Stilly South Holmes Harbor Shellfish Protection Program</p> <p>Island County Water Resource Management Plan, Island County Public Health</p> <p>Central/South Whidbey Watershed Non-Point Pollution Prevention Action Plan, Island County Planning Department</p> <p>North Whidbey Watershed Non- Point Pollution Prevention Action Plan/Implementation, Island County Planning Department</p> <p>Camano Island Watershed Non- Point Pollution Prevention Action Plan, Island County Planning Department</p>

Species and food webs sustained (biodiversity)

(Includes some Habitat)

Proposed Priority Actions	Key Planning Documents and Work Plans
<p>Overall Whidbey Basin:</p> <ul style="list-style-type: none">• Fully fund priority actions listed in watershed salmon conservation plan (adopted as part of the federal Puget Sound Salmon Recovery Plan.• Maintain pacific hake fishery closures until population status improves.• Resume monitoring of pacific hake populations status in Port Susan.• For Rockfish: See “The Biology and Assessment of Rockfishes in Puget Sound” to be distributed April 30.• For Pacific cod: maintain reduced fishing pressure until population status improves.• For Coho: continue to manage fisheries according to the comanagers’ comprehensive coho management plan.• Protect habitat that currently supports coho production, especially summer and winter rearing.• Implement recommendations from the Hatchery Scientific Review Group pertaining to coho salmon.• Continue and expand studies of the ecological interactions between hatchery-produced fish and natural origin coho salmon.	Puget Sound Salmon Recovery Plan

<ul style="list-style-type: none"> • For chum salmon: continue to manage fisheries according to the comanagers' Puget Sound Salmon Management Plan. • For pink salmon: Continue to manage fisheries according to the comanagers' Puget Sound Salmon Management Plan. • For sockeye salmon: Continue the trap and haul operation and maintenance of spawning beaches. • For steelhead trout: Assess and analyze the threats that are exacerbating the risk factor for Puget Sound steelhead • Develop strategies to address threats to steelhead and actions to implement the strategies. Call this a "recovery plan" and implement. • For Grey whales: Protect beaches in Saratoga Passage, Port Susan, and Skagit Bay where whales feed. • Implement salmon recovery plans, and integrate their recommendations in to land use regulations; • Restore nearshore, estuary, floodplain, and mainstem habitats and the salmon's access to these habitats; • Protect existing salmon habitat from future degradation. 	
<p><u>Snohomish:</u></p> <ul style="list-style-type: none"> • Over the next ten years, 80% of the habitat restoration efforts should focus on nearshore, estuary, and mainstems; 15% should focus in lowland tributaries; and 5% in headwater areas. • Nearshore beaches and shoreline: at least 9.4 mile by 2015 • Estuary/Tidal Marsh: 2,720 acres by 2015 • Restored Edge Habitat: 246.4 miles by 2015 • Restored Riparian Habitat: 6,247 acres by 2015 • Restored Off-Channel Habitat: 517 acres by 2015 • Large Woody Debris Established: 41 new logjams in next ten years • Other sub-basin restoration: <ul style="list-style-type: none"> ○ Restored Riparian Habitat: 94 acres in next ten years ○ Restored Off-Channel Habitat: 57 acres in next ten years 	<p>Puget Sound Salmon Recovery Plan, Snohomish Recovery Chapter, and 2006/2007/2008 Three-Year Work Plans</p>

<p><u>Stillaguamish:</u></p> <ul style="list-style-type: none"> • Protect and restore areas and functions surrounding critical salmon habitat: <ul style="list-style-type: none"> ○ Restore 195 acres and plant 400 acres of riparian forest over next ten years ○ Create 51 engineered log jams to provide immediate channel complexity over next ten years ○ Restore 30 acres and remove 4.1 miles of armoring in the floodplain over next ten years ○ Restore 195 acres and create 120 acres of estuary over next ten years • Prevent further fragmentation of aquatic habitat • Improve connectivity between isolated habitat patches 	<p>Puget Sound Salmon Recovery Plan 2006/2007/2008 Three-Year Work Plans Stillaguamish Chinook Recovery Plan</p>
<p><u>Island:</u></p> <ul style="list-style-type: none"> • Preserve, restore, and enhance nearshore habitats and the ecological processes that form them. • Top priority areas for restoration and protection (mudflats, marshes, and pocket estuaries): Deception Pass, Skagit Bay, and Port Susan, and these shoreline miles within five miles of the mouths of the Skagit, Stillaguamish and Snohomish Rivers. • Medium priority areas for restoration and protection (sand flats and sand and gravel beaches): Saratoga Passage, Possession Sound, Southeast Admiralty Inlet, and Northwest Whidbey Island. • Lower priority area for restoration and protection (cobble beaches, rock cliffs, and man-made structures): West side of Whidbey south of West Beach and north of Double Bluff • Implement protection regulations 	<p>Puget Sound Salmon Recovery Plan 2006/2007/2008 Three-Year Work Plans Island Salmon Recovery Plan</p>

<p>Skagit:</p> <ul style="list-style-type: none"> • Protect stream flow, basin hydrology, water and sediment quality and sediment transport, stream channel complexity, riparian areas and wetlands, estuary and nearshore, and fish passage and access • Restore habitat for each life cycle stage: • Restore isolated or impaired habitat; • Physical processes such as sediment transport or hydrology; • Restore freshwater rearing habitat in large river floodplains, tributaries, and non-tidal delta: • Remove or upgrade hydromodifications on main channel, • Plant riparian vegetation, restoring natural floodplain processes by removing or relocating floodplain modifications, and/or re-connecting historic floodplain channels; • Restore tidal delta rearing habitat: • Reestablish historic estuarine wetlands through dike and levee removal or setbacks; • Reestablish downstream migration corridors that provide for dispersion of juvenile Chinook to spatially diverse habitats; • Restore lost pocket estuary marsh, channels, and impoundments; • Reestablish tidal connectivity and volume within pocket estuaries; • Restore armored sediment source beaches in littoral cells that create and maintain spits forming pocket estuaries, lost or degraded freshwater inputs to pocket estuaries; • Restore known forage fish habitats; • Remove impediments to fluvial and coastal sediment transport processes 	<p>Puget Sound Salmon Recovery Plan 2006/2007/2008 Three-Year Work Plans Skagit Salmon Recovery Chapter</p>
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Skagit

- Sequence restoration and protection actions for the Skagit Delta/Estuary and the Skagit Mainstem first
 - Specific Skagit Delta/Estuary areas: connectivity across Fir Island and the North Fork to Swinomish Channel
 - Specific Mainstem areas: Specific areas: Lower Sauk, Cockerham area, from Darrington downstream, between Concrete and Sedro-Woolley (mainstem within the Spring Chinook spawning area)
- Nearshore: restore and retain pocket estuary habitats, and restore and preserve the natural geological beach processes that create and maintain nearshore forage fish habitats.
- Estuary and freshwater tidal areas: restore access to isolated habitats, re-establish migration pathways among existing habitats, and restoring the hydrological and ecological processes that form and maintain these habitat areas.
- Lower/Middle Skagit: re-establish hydraulic connectivity to disconnected side-channel habitats, to re-establish access to off-channel habitats, and to restore the habitat quality of main stem margin habitats. The latter habitats have been widely impacted by diking and bank armoring in the lower and middle Skagit.
- Upper Skagit Sub-Basin: improve juvenile salmon and steelhead rearing areas:
- Sauk River Sub-Basin: protect spawning areas for summer Chinook and diverse rearing habitat for spring Chinook.

Harvest Management:

- Continue to manage according to the Co-managers' Plan (Puget Sound Indian Tribes and Washington Department of Fish and Wildlife 2004).
- Resolve problems that are causing computed rebuilding exploitation rates (RERs) to be exceeded, for example, harvest levels in fisheries north of the US/Canada border.,
- Develop RERs for populations that are lacking them (e.g. Snoqualmie, S. For Stillaguamish)
- Review and revise existing RERs based on updated information.

Hatchery Management

- Continue the implementation of appropriate recommendations from the Hatchery Scientific review group and others in Whidbey basin Chinook salmon hatcheries.
- Continue and expand studies of the ecological interactions between hatchery-produced fish and natural origin Chinook salmon.

Water Quantity for People, Fish, and the Environment

Proposed Priority Actions	Key Planning Documents and Work Plans
<p>Skagit watershed</p> <ul style="list-style-type: none"> • Increase State enforcement and compliance of the Water Code • Develop flexible water supply solutions to provide legal water supplies to agricultural water users needing irrigation water supply • Meter water right permitted and water rights exempt uses 	<p>Skagit Salmon Recovery Chapter in Puget Sound Salmon Recovery Plan, 2007 Skagit Comprehensive Irrigation District Management Plan (CIDMP), 2006</p>
<p>Island County</p> <ul style="list-style-type: none"> • Increase groundwater monitoring for water availability and water quality. • Active management of proposed new water uses for Seawater Intrusion Risk. • Improve coordination and planning between water systems. 	<p>Island County Water Resource Management Plan, 2005</p>
<p>Snohomish watershed</p> <ul style="list-style-type: none"> • Meter 80% of water use in the Snohomish watershed • Document historic and current hydrology, document high and low-flow problems, and prioritize flow problems. • Assess future impacts to streamflow and water supply from climate change • Provide healthy groundwater for future generations <p>Stillaguamish watershed</p>	<p>Ecology's Metering Compliance Plan) Snohomish River Basin Salmon Conservation Plan in the Puget Sound Salmon Recovery Plan State of the Stilly</p>

Quality of Life

Proposed Priority Actions	Key Planning Documents and Work Plans
<p><u>Recreation</u></p> <ul style="list-style-type: none"> • Enhance, or increase the capacity of, State Highway 2 to reduce traffic delays and fatalities as the community accesses recreational opportunities in the Wild Sky Wilderness Area and Steven's Pass ski area. • Increase the recreational opportunities of the Snohomish River Estuary, through trails, access to low impact boating (e.g., kayaking) and other activities. Establish educational programs and opportunities that link recreation to learning about Puget Sound. • Manage fisheries for intergenerational recreational benefits (ensure that fisheries will yield recreational opportunities for future generations). • Ensure water quality for fishing, swimming and other types of recreation 	<ul style="list-style-type: none"> • Nearshore Cooperative Report • Salmon Recovery Plans, Dungeness crab reports, MRC work plans. • State and local water quality programs
<p><u>Commercial Activity</u></p> <ul style="list-style-type: none"> • Increase the viability of agriculture in the Whidbey Basin. • Recover harvestable levels of salmon. • Increase and/or maintain recreational fishing opportunities. • Establish a link between healthy agriculture and healthy runs of salmon to demonstrate the value of each to the other. 	<ul style="list-style-type: none"> • Snohomish County Agricultural Sustainability Project, King County policy statements • Snohomish River Basin Salmon Conservation Plan • Wild Steelhead Coalition
<p><u>Aesthetic Resources</u></p> <ul style="list-style-type: none"> • Preserve scenic viewsheds of the Cascades, Olympics and Puget Sound • Where outlined and detailed, preserve and/or enhance historical architecture and neighborhoods. 	<ul style="list-style-type: none"> • City of Everett Comprehensive Plan • Comprehensive plans, neighborhood associations

<p><u>Cultural Resources</u></p> <ul style="list-style-type: none"> • Preserve tribal culture and ways of life, including language, ceremonial uses of resources, maintaining/growing the amount and availability of native medicinal and other plants, restoring salmon runs, and preserving tribal fishing access/areas. • Maintain agricultural uses and preserve rural ways of life. 	<ul style="list-style-type: none"> • Tulalip Tribes website, salmon plans • Comprehensive Plans and Snohomish Agricultural Sustainability Project
<p><u>Other.</u></p> <ul style="list-style-type: none"> • Establish measures for ‘greening’ local commuting to work and outside of work. Use these figures to direct increases in transit use tied to Puget Sound health and improving traffic. Highlight safety issues... • Establish the role of ecosystem services and the explicit links to our local and regional development. • Encourage development within urban growth areas (UGAs) and seek to maintain rural lands with low densities. • Enhance and expand TDR/PDR programs to conserve farmlands and other lands. 	<ul style="list-style-type: none"> • Puget Sound Transit • Ecosystem Services, WRI • State GMA • Snohomish County Comprehensive Plan • County TDR/PDR programs

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